9B-12

OLEG SOKOLOV
28 Rose Lane # 38
Danbury, CT 06811
Tel., Fax (203) 743-4458

FACSIMILE COVER SHEET

FAX COPY RECEIVED
GROUP 2500

To: Sr. **Examiner C. Church**
Company: **The USA Patent and Trademark Office**
Location:
Phone: (703) 308-4861
Faxes: (703) 308-7722
(703) 308- 5841
Date: January 4, 1999
Pages includ. this Cover page: 5

FAX COPY RECEIVED
GROUP 2500

FAX COPY RECEIVED
GROUP 2500

Message:

Re: Patent application 08/924,497, Art Unit 2876

Attached please find corrected claim 55 and pages 5-7 of remarks for project of amendment of named above application which was discussed with Examiner during the Personal Interview at October 28,1998 and following telephone conversations.

Claim 55 is corrected in connection with Interview summary and following advice of Examiner during the telephone discussion at December 31, 98.

Corrected remarks are contain the explanation of grid ratio and also give in more detail computing of number of blocking of primary radiation during the movement of grid under the advice of Examiner by telephone at December 29, 98.

Applicant thanks very much to Examiner for his advises and will call at January 4, 99, Tuesday after 10 a.m. as was agreed.

This fax is sending to two fax numbers in reason with problems of receiving.

Happy New Year!

Sincerely yours,
Oleg Sokolov
Oleg Sokolov

(2)

January 3, 1999

Sr. Examiner, C. Church , Application 08/924,497.
Aplicant O. Sokolov.

PROJECT OF INDEPENDENT CLAIM IN CONNECTION WITH INTERVIEW SUMMARY.

55. (amended) A flat focused cellular grid comprising two opposite flat end surfaces as an upper surface and a lower surface, [said grid has at least one longitudinally extended side] and a focal point and a plurality of throughgoing holes named cells extending through said grid from one of said end surface to the other said end surface, said cells are [and] separated by a plurality of X-ray absorbing partitions each of said partitions facing one of said cells, and on a cross-section of a side view of said grid each of the sides of said cells are formed along the hypotenuse of a right triangle formed by said hypotenuse extending from the intersection of said side of said cells with said lower surface of said grid to said focal point and by perpendicular of said focal point to said lower surface of said grid and also by said lower surface of said grid between said intersection of said side of said cell and intersection with said perpendicular from said focal point, said sides of said cells having different lengths from said upper surface to said lower surface for each said side of each said cell and said length for each of said sides of each of said cell is proportional to said hypotenuse corresponding to each said side, said cells in a view of one of said end surfaces farther having sides [and diagonals] that are neither perpendicular nor parallel to direction of movement of said grid during exposure by x-ray through said grid, [when said longitudinally extended side is substantially parallel to said direction of said movement of said grid,] and the angles that each side of each said cell of said grid in said view of one said end surfaces makes with the said direction of said movement of said grid provide a complete erasing of images of said cells on the x-ray image during an x-ray procedure with said movement of said grid, and means for moving of said grid **in said direction** during an x-ray exposure procedure.

3

Regarding paragraph 3 page 2 Applicant has respectfully to note:

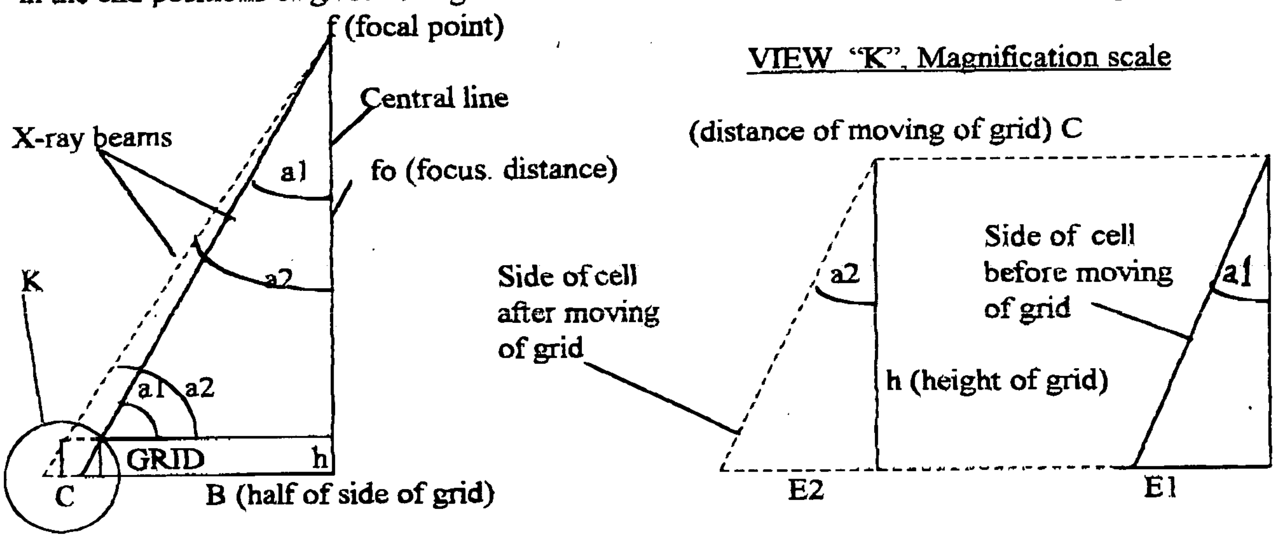
Under the objection of Examiner Applicant amended claims and took off diagonals of cells not parallel nor perpendicular to longitudinal side of the grid.

Applicant appreciate and has been accepted the advice of Examiner during the interview at December 28, 98 that support in drawing is not enough for inserting to the claim parallelism of direction of movement of grid to the longitudinally extended side of grid.

On Examiner's objection that during movement the flat focused grid will block all or almost all primary X-ray applicant respectfully has been submitted next calculations:

Mostly grids move onto distance from 5 to 10 mm to each side from central beam which is perpendicular from focal point to surface of grid.

As result of moving of central line of grid away from the central x-ray beam when the grid moves appears the loosing of small part of primary radiation and as result the unsugnifcunt increasing of dose of radiation for patient. The maximum loosing of primary in the end positions of grids during their movement are understandable from following:



direction of movement of grid

Fig.

On the drawing showed on the above Fig. the shadow from side of cell as result of movement of x-ray grid relative to X-ray beam is difference between lengths of sides -E2- and -E1- in triangles corresponding to height of grid -h-.

The height of grid -h- determines as product of grid ratio -r- by distance between sides of cell -D- :

$$h = r \times D \tag{1}$$

4

The grid ratio -r- under the International Electrotechnical commission (IEC) is given by:

$$r = \frac{h}{D} \qquad (2)$$

Sides E2 and E1 are proportional to tan a2 and tan a1 accordingly.

a1 is angle between the top apex of side of cell and x-ray beam which comes to this apex before movement of grid.

a2 is angle between same apex of cell and x-ray beam coming to this apex after the movement of grid.

$$\tan a1 = \frac{B}{fo} \quad (3) \qquad\qquad \tan a2 = \frac{B + C}{fo} \quad (4)$$

Come to the basic numbers for General purpose Cellular Grid X-ray grid:

fo = 1000 mm, B = 250 mm (for side of grid about 500 mm), D=250 mkm

The results after following computing:

tan a1 = .25, tan a2 = .255 for movement of grid 5 mm and .26 for movement of grid 10 mm.

Difference between tan a2 and tan a1 or in math writing (tan a1 - tan a2) are .005 for moving of grid 5 mm and .01 for moving 10 mm.

The length of shadow from side of cell with x-ray beam in the end position of grid:

$$E2 - E1 = h \times (\tan a2 - \tan a1) \qquad (5)$$

<u>For grids with distance of movement C = 5 mm</u>

for grid ratio r = 4:

E2- E1 = 1 mm x .005 = .005 mm = 5 mkm

where 1 mm is height of grid h, (h for g. ratio 4 = r X D = .25 mm X 4 = 1 mm)

for grid ratio r = 12:

E2- E1 = 3 mm x .005 = .015 mm = 15 mkm

where 3 mm is height of grid h, (h for g. ratio 12 = r X D = .25 mm X 12 = 3 mm)

<u>For grids with distance of movement C = 10 mm</u>

for grid ratio r = 4:

E2- E1 = 1 mm x .010 = .010 mm = 10 mkm

<u>for grid ratio r = 12:</u>

E2- E1 = 3 mm x .010 = .030 mm = 30 mkm

% of blocking of primary radiation -L- is given by:

$$L = \frac{E2 - E1}{D} \times 100\ \% \qquad (6)$$

After the computing for end positions of grids (which are small component of dynamic positions of grid during it movement) the showed above trigonometry calculations give the result for the blocking of primary radiation from 2 % (for grids with ratio 4 and movement 5 mm) till 12 % (for grid with ratio 12 - max. ratio for cellular Grids and movement 10 mm).

Integrated loosing (or blocking) of primary radiation during the movement of grid defines by formula (7):

$$\%\ \text{of loosing (or blocking) of primary radiation} : \int_0^S \frac{dx}{x} \qquad (7)$$

where S is % of loosing of primary radiation on end positions of movable grid 5 and 10 mm from central beam computed above under (6).

Finally the computing of real number of loosing of primary radiation gives the result from .69 % for grids with ratio 4 and movement 5 mm (.197 in.) to 2.48 % for grids with ratio 12 and movement 10 mm (.394 in), there are very small numbers which show that practically loosing of primary radiation and following increasing of dose doesn't come with moving of grid during the X-ray procedure in today's technology.

Applicant has respectfully to note that all contemporary X-ray machines in the world for conventional medical x-ray technology are supplied by Bucky mechanisms for movement of grids in which using grids have been installed. Without these today's x-ray medical technology can't work.

Caldwell

Caldwell's reference discloses **a radially focused <u>circular</u> x-ray grid** that is composed of simple thin lead strips (lead is only soft x-ray absorbent but not construction material and it can't keep the configuration of strips), the strips on the side view are the parts of the radiuses from the focus of grid and they have the uniform length as result this grid cannot provide required sharpness of x-ray images, Caldwell's grid having cells for the transmission of the X-rays with sides oriented about 45 degrees to the direction of movement of grid which doesn't provide the erasement of images of cells on the mentioned x-ray images. Caldwell does not suggest like in current application or even imply the **hypotenusely oriented <u>flat</u> cellular grid** where on the side view the thin partitions (Caldwell calls them strips) between cells have the different lengthproportionally to hypotenuses oriented along them to the focus of grid which provide required sharpness of x-ray images, and sides of cells oriented on the plane view onto such